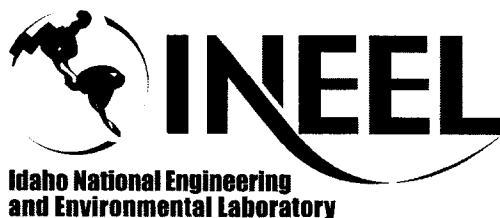

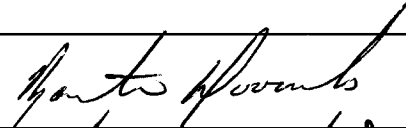
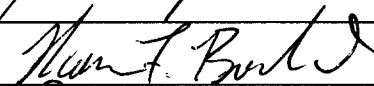
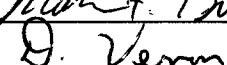


Engineering Design File

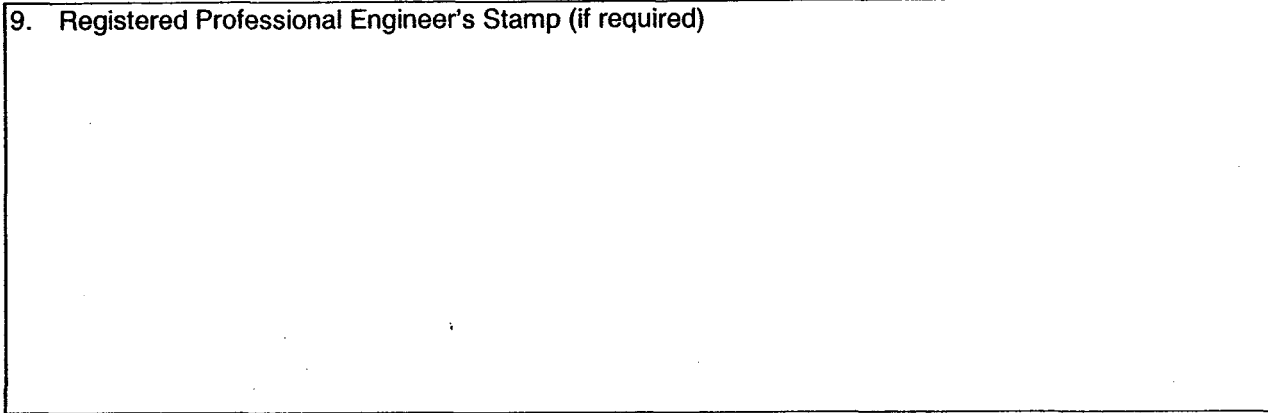
Evaluation of Geotechnical Investigations Required to Complete Design and Construction



Form 412.14
07/24/2001
Rev. 03

1. Title: Evaluation of Geotechnical Investigations Required to Complete Design and Construction				
2. Project File No.: NA				
3. Site Area and Building No.: NA		4. SSC Identification/Equipment Tag No.: NA		
5. Summary: <p>As part of the work to prepare the drawings, specifications, and calculations/studies for the INEEL CERCLA Disposal Facility (ICDF), an evaluation of the existing geotechnical information was performed. In general, the existing geotechnical information is thorough and complete. The existing information provides a strong base for the preparation of the Title I Design and completion of the remedial design/construction work plan (RD/CWP). However, in development of the design studies and calculations for slope stability assessment, fate and transport modeling, and final cover hydraulic modeling and life cycle evaluation, specific data gaps requiring additional geotechnical testing, investigation, or survey were identified.</p> <p>The attached table provides a summary of additional geotechnical investigations and calculations (including laboratory testing) required to complete the RD/CWP. The summary table provides the engineering design file (EDF) number and justification for the additional investigation. Where applicable, the type and quantity of laboratory tests required is identified.</p> <p>Some of the additional testing has been performed in subsequent design phases for the ICDF. Additional interface shear tests were performed as recommended. Results of this additional testing are provided in "Slope Stability Assessments" (EDF-ER-268).</p> <p>Geological observations during the Phase I excavation of the ICDF in Summer 2001 and additional borings were performed by BBWI in the landfill footprint to further define bedrock elevations and sediment thickness.</p>				
6. Review (R) and Approval (A) and Acceptance (Ac) Signatures: (See instructions for definitions of terms and significance of signatures.)				
	R/A	Typed Name/Organization	Signature	Date
Performer		Mike Reimbold/ CH2M HILL		05/14/02
Checker	R	(Same as Independent Peer Reviewer)		05/14/02
Independent Peer Reviewer	A	Marty Doornbos/ BBWI		05/14/02
Approver	A	Thomas Borschel/ BBWI		05/14/02
Requestor	Ac	Don Vernon/ BBWI		05/14/02
7. Distribution: (Name and Mail Stop)		M. Doornbos, MS 3930; D. Vernon, MS 3930; T. Borschel, MS 3930		
8. Records Management Uniform File Code (UFC):				
Disposition Authority:			Retention Period:	
EDF pertains to NRC licensed facility or INEEL SNF program?: <input type="checkbox"/> Yes <input type="checkbox"/> No				

9. Registered Professional Engineer's Stamp (if required)



ACRONYMS

ASTM	American Society for Testing Materials
BBWI	Bechtel BWXT Idaho, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EDF	engineering design file
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
RD/CWP	remedial design/construction work plan
TBD	to be determined

Table 1. Draft evaluation of geotechnical investigations and calculations required to complete design and construction.

No.	Additional Investigation, Testing or Calculation Required	Related EDF No.	Justification for Additional Investigation, Testing or Calculation	Test Standard	No. Tests	Comments
1	Site-Specific Interface Direct Shear Testing on Lining System Geosynthetics (individual interface tests required listed below)	Engineering design file (EDF)-ER-268 and EDF-ER-282	Slope Stability Assessment and Seismic Evaluation of Lining System have been performed using interface strength characterization data for the geosynthetics from previous projects, the technical literature, and manufacturers. Variability in test set-up and products used in this data require that site-specific testing on lining system products be performed to verify the strength parameters used for lining system interfaces. Test requirements are based on the double composite lining system with a geosynthetic clay liner (GCL).			Results of site-specific interface direct shear testing will be used to verify that material strengths used in slope stability assessments and seismic evaluation are appropriate. Values used in current analysis are based on conservative assessment of available data from similar projects, technical literature, and manufacturers, thus the likelihood of lower site-specific test results impacting the conclusions of the slope stability assessments is considered low.
1a	Operating Layer Soil/Geocomposite	EDF-ER-268 and EDF-ER-282	See 1. Above	ASTM D5321 ^a	2	<p>Construction Interface Documents for this additional testing (items 1a through 1f) were prepared and recommended testing was completed in subsequent design phases. Results of additional site-specific interface shear testing (items 1a through 1f) are reported in "Slope Stability Assessments" (EDF-268).</p> <p>One test each required at low (less than 600 psf) and high normal confining stress (2,000 to 10,000 psf).</p>

Table 1. (continued)

No.	Additional Investigation, Testing or Calculation		Justification for Additional Investigation, Testing or Calculation		Test Standard	No. Tests	Comments
	Required	Related EDF No.					
1b	Geocomposite/Text high-density polyethylene (HDPE) Geomembrane	EDF-ER-268 and EDF-ER-282	See 1. Above		ASTM D5321 ^a	2	One test each required at low (less than 600 psf) and high normal confining stress (2,000 to 10,000 psf).
1c	Text HDPE Geomembrane/Nonwoven GCL	EDF-ER-268 and EDF-ER-282	See 1. Above		ASTM D5321 ^a ASTM D6243 ^b	2	One test each required at low (less than 600 psf) and high normal confining stress (2,000 to 10,000 psf).
1d	Nonwoven GCL/Geocomposite	EDF-ER-268 and EDF-ER-282	See 1. Above		ASTM D5321 ^a ASTM D6243 ^b	2	One test each required at low (less than 600 psf) and high normal confining stress (2,000 to 10,000 psf).
1e	GCL Internal Shear	EDF-ER-268 and EDF-ER-282	See 1. Above		ASTM D5321 ^a ASTM D6243 ^b	1	Required at high normal (2,000 to 10,000 psf) confining stress only.
1f	Text HDPE Geomembrane/Soil bentonite liner	EDF-ER-268 and EDF-ER-282	See 1. Above		ASTM D5321 ^a	2	One test each required at low (less than 600 psf) and high normal confining stress (2,000 to 10,000 psf).
2	Site-specific data for final cover soil/rock needed for Final Cover Life Cycle and Hydrologic Modeling studies	EDF-ER-279 and EDF-ER-281					Approximated quantities of material needed for Items 2a and 2b will be provided to Bechtel BWXT Idaho, LLC (BBWI) in to assist in borrow area determination. Revised quantities of materials based on the 90% RD/CWP design submittal will be provided to BBWI under separate cover.

Table 1. (continued)

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No.	Additional Investigation, Testing or Calculation Required	Related EDF No.	Justification for Additional Investigation, Testing or Calculation	Test Standard	No. Tests	Comments	
2a	Water storage layer soil borrow source	EDF-ER-279 and EDF-ER-281	The INEEL CERCLA Disposal Facility (ICDF) landfill final cover may include a soil layer to provide water storage. Soil consisting of a silty loam provides good water storage. Potential borrow sources need to be identified and characterized to determine applicability for a water storage soil source for the final cover.	Specific test requirements.	To be determined (TBD)	Site-specific investigations are required.	
2b	Riprap armor source	EDF-ER-281	The ICDF landfill final cover may include rock armoring for the sideslopes and biointrusion layers. A rock borrow source needs to be identified and characterized. Durability testing should be performed on rock that will be exposed on the landfill cover.	Specific test requirements (TBD)	TBD	A review of existing information including nearby pits should be evaluated prior to performing intrusive activities.	
3	Additional geotechnical quality control test results for the test pad	Not Applicable	During Phase 1 construction, CH2M HILL performed many quality control tests on the completed test pad and test pad soils. This additional data is intended to supplement data presented in EDF-2899.	ASTM standards were used for all geotechnical testing.	Not Applicable	Geotechnical test results from Phase I construction performed by CH2M HILL are included in Appendix A.	

Table 1. (continued)

No.	Additional Investigation, Testing or Calculation Required	Related EDF No.	Justification for Additional Investigation, Testing or Calculation	Test Standard	No. Tests	Comments
4	Additional geologic/geotechnical data for ICDF	Not Applicable	During excavation of ICDF Cell 1 in Summer 2001, geologic observations were recorded by BBWI geologist. In addition, at completion of Phase I excavation, BBWI performed additional borings within the ICDF Cell 1 footprint to further define bedrock elevation and sediment thickness. This additional data is intended to supplement data presented in the ICDF Geotechnical Report.	Not Applicable		Geotech data obtained during excavation activities are presented in Appendix B.
<p>a. ASTM D5321 - Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic Friction by the Direct Shear Method</p> <p>b. ASTM D6243 - Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method</p>						
REFERENCES						
ASTM D5321-92, 1992 (1997), "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic Friction by the Direct Shear Method," American Society for Testing and Materials, (reapproved 1997).						
ASTM D6243-98, 1998, "Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method," American Society for Testing and Materials, 1998.						
EDF-ER-268, 2002, "Slope Stability Assessments," Rev. 1, Environmental Restoration Program, Idaho National Engineering and Environmental Laboratory, May 2002.						
EDF-ER-279, 2002, "Hydrologic Modeling of Final Cover," Rev. 2, Environmental Restoration Program, Idaho National Engineering and Environmental Laboratory, May 2002.						
EDF-ER-281, 2002, "Liner and Final Cover Long-Term Performance Evaluation and Final Cover Life Cycle Expectation," Rev. 1, Environmental Restoration Program, Idaho National Engineering and Environmental Laboratory, May 2002.						
EDF-ER-282, 2002, "Seismic Evaluation of Landfill and Evaporation Pond," Rev. 1, Environmental Restoration Program, Idaho National Engineering and Environmental Laboratory, May 2002.						
EDF-2899, 2002, "Test Pad Post-Construction Report," Rev. 0, Environmental Restoration Program, Idaho National Engineering and Environmental Laboratory, May 2002.						